

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : H04Q 7/04	A1	(11) International Publication Number: WO 94/08433 (43) International Publication Date: 14 April 1994 (14.04.94)
(21) International Application Number: PCT/SE93/00784 (22) International Filing Date: 30 September 1993 (30.09.93) (30) Priority data: 9202847-1 1 October 1992 (01.10.92) SE (71) Applicant (for all designated States except US): AB NOR-DICTEL [SE/SE]; S-371 80 Karlskrona (SE). (72) Inventors; and (75) Inventors/Applicants (for US only) : HERMANSSON, Jan [SE/SE]; Psilanderhielms väg 14, S-371 60 Lyckeby (SE). MÄNSSON, Christer [SE/SE]; Bokvägen 2, S-371 43 Karlskrona (SE). JACOBSSON, Anders [SE/SE]; Gredeby, S-370 24 Nätraby (SE). NYSTRÖM, Zeth [SE/SE]; Gäddvägen 42, S-382 38 Nybro (SE). KARLS-SON, Bo [SE/SE]; Friströms väg 12, S-371 60 Lyckeby (SE). PALMGREN, Christer [SE/SE]; Muraregatan 23 A, S-371 38 Karlskrona (SE). LEUHUSEN, Göran [SE/SE]; Ronnebygatan 45, 2 trp, S-371 33 Karlskrona (SE). ÖRNEHOLM, Flemming [DK/SE]; Styrmansgatan 28, S-371 36 Karlskrona (SE).		(74) Agent: AWAPATENT AB; Box 5117, S-200 71 Malmö (SE). (81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, LV, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>
(54) Title: DIGITAL MOBILE TELEPHONE SYSTEM IN WHICH EACH SUBSCRIBER IS ASSIGNED A TELEPHONE NUMBER AND SEVERAL SUBSCRIBER IDENTITY MODULE (SIM) CARDS		
(57) Abstract <p>A digital mobile communication system comprises a switching centre (MSC), a subscriber register (HLR) connected thereto, mobile terminals, such as mobile telephones, and subscriber-linked subscriber's cards, such as smart cards. Each subscription is allocated a subscriber's number and at least two subscriber's cards adapted to be activated so as to open a mobile terminal to incoming as well as outgoing traffic when inserted therein. When one of the subscriber's cards is activated, the other card or cards are necessarily deactivated so as to open a mobile terminal only to outgoing traffic when inserted therein. The subscriber register (HLR) is adapted to control the activation and the deactivation of the cards by the order of the subscriber.</p> <div data-bbox="909 1260 1347 1911"> <pre> graph TD VLR --- MSC HLR --- MSC MSC --- VMS MSC --- BASS MSC --- BSC1 MSC --- BSC2 BSC1 --- MT BSC1 --- BTS1 BSC2 --- BTS2 BSC2 --- BTS3 </pre> </div>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FR	France	MR	Mauritania
AU	Australia	GA	Gabon	MW	Malawi
BB	Barbados	GB	United Kingdom	NE	Niger
BE	Belgium	GN	Guinea	NL	Netherlands
BF	Burkina Faso	GR	Greece	NO	Norway
BG	Bulgaria	HU	Hungary	NZ	New Zealand
BJ	Benin	IE	Ireland	PL	Poland
BR	Brazil	IT	Italy	PT	Portugal
BY	Belarus	JP	Japan	RO	Romania
CA	Canada	KP	Democratic People's Republic of Korea	RU	Russian Federation
CF	Central African Republic	KR	Republic of Korea	SD	Sudan
CG	Congo	KZ	Kazakhstan	SE	Sweden
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovak Republic
CM	Cameroon	LU	Luxembourg	SN	Senegal
CN	China	LV	Latvia	TD	Chad
CS	Czechoslovakia	MC	Monaco	TG	Togo
CZ	Czech Republic	MG	Madagascar	UA	Ukraine
DE	Germany	ML	Mali	US	United States of America
DK	Denmark	MN	Mongolia	UZ	Uzbekistan
ES	Spain			VN	Viet Nam
FI	Finland				

Digital mobile telephone system in which each subscriber is assigned a telephone number and several Subscriber Identity Module (SIM) cards.

5

Field of the Invention

This invention relates to a digital mobile communication system comprising a switching centre, a subscriber register connected thereto, mobile terminals, such as
10 mobile telephones, and subscriber-linked subscriber's cards, such as smart cards, insertable in the mobile terminals.

Description of the Prior Art

15

With mobile communication systems, it is always possible to reach the subscribers within the coverage area of the system, regardless of where they are, which is a considerable advantage. It may also be advantageous, e.g.
20 when travelling, to have a telephone ready to hand at all times and thus not have to depend on pay phones and small change when making important telephone calls.

In prior-art mobile communication systems, the subscriber's number has always been linked to the mobile
25 telephone itself, so that a subscriber possessing two mobile telephones, e.g. one mounted in a vehicle and one to be carried along, has had at that two different subscriber's numbers and, consequently, two different subscriptions. However, this inconvenience of the subscriber
30 having different subscriber's numbers and different subscriptions when possessing several mobile telephones was initially not inherent in a new digital mobile communication system called GSM (Global System for Mobile Communications).

35 This system, which has a large coverage area as a result of far-reaching international cooperation, is distinguished by communication taking place by means of digi-

tal signal transmission and by the subscription being linked to a subscriber's card that can be inserted by the subscriber in different mobile terminals in order to activate these. A mobile terminal holding such a subscriber's card can be reached at the subscriber's number linked to the subscriber's card, and outgoing traffic from this mobile terminal, such as telephone calls, telefax transmissions and data communication, is as a rule debited the subscription linked to the subscriber's card, i.e. the mobile terminal as such is of minor importance in this system and the subscription is embodied by the subscriber's card.

The subscriber's card is a so-called smart card which in GSM contexts is referred to as SIM (Subscriber Identity Module) and contains at least one microchip which holds information on the subscription and which, when the SIM card is inserted in a mobile terminal, is connected thereto.

The original SIM card had the size of an ordinary credit card and was intended to be insertable in any GSM mobile terminal. However, the "credit-card" size soon proved to be inconvenient in small pocket phones, and a smaller "stamp-size" SIM card, containing the same type of microchip and thus compatible with the large SIM card, was introduced as a complement to the large card. Generally, the small SIM card fits all existing mobile terminals but is not, owing to its small size, as easy to handle as the large card and therefore is best suited to be more or less permanently installed in a mobile terminal.

When subscribing to GSM, the customer has to choose between a large SIM card, which is easy to handle and store owing to its "credit-card" size but which is too large for small pocket phones, and a small SIM card, which certainly fits into small pocket phones but which is difficult to handle and easily lost owing to its small size.

The only possibility up to now has been to recommend the customer to have two GSM subscriptions, one for each card. This solution not only has the inconvenience of entailing a double set of bills, giving both the GSM network operator and the subscriber extra trouble, but also involves uncertainty as to the subscriber's number at which the subscriber can be reached at the moment, two subscriptions requiring by necessity two different subscriber's numbers.

10

Object of the Invention

The object of this invention is to remedy the above inconveniences.

15

Summary of the Invention

According to the invention, this object is achieved by a digital mobile communication system of the type mentioned by way of introduction, which is characterised in that each subscription is allocated a subscriber's number and at least two subscriber's cards adapted to be activated so as to open a mobile terminal to incoming as well as outgoing traffic when inserted therein, such that, when one of the cards is activated, the other or others are necessarily deactivated so as to open a mobile terminal only to outgoing traffic when inserted therein, the subscriber register being adapted by the order of the subscriber to control the activation and the deactivation of the cards.

30

Preferably, the cards have different identity numbers, each stored in a record in the subscriber register, the subscriber number is stored only in the record containing the identity number of the activated card, and the subscriber register is adapted, by the order of the subscriber, to shift the identity numbers between the different records so as to activate and deactivate,

35

respectively, the cards. Alternatively, it may be the subscriber's number and not the identity numbers that is shifted between the different records so as to activate and deactivate, respectively, the cards, or the identity numbers can each be stored in an element in one and the same record in the subscriber register, the subscriber's number being linked only to the element containing the identity number of the activated card, and the subscriber register being adapted, by the order of the subscriber, to link the subscriber's number to another of the elements in the record so as to activate and deactivate, respectively, the cards.

Finally, one of the subscriber's cards preferably is a small "stamp-size" card, while another of the subscriber's cards is a large "credit-card-size" card.

Preferred embodiments of the invention will be described in more detail below with reference to the accompanying drawings.

Brief Description of the Drawings

Fig. 1 is a general schematic view of a mobile communication system; and

Fig. 2 is a schematic view of a large and a small subscriber's card, as well as of the associated mobile terminals.

Description of the Preferred Embodiments

The illustrated mobile communication system is generally known as GSM and is based on subscriber's cards in the form of smart cards and on digital signal transmission. The reference signs used throughout this specification are essentially in keeping with the terminology used in this system.

In GSM, the wireless signal transmission between a mobile station MS, such as a mobile telephone, a fax machine or a computer, and a base station BTS (Base Transceiver System) is digital and less sensitive to interference. A base station BTS is made up of a transceiver aerial and defines a certain coverage area.

A GSM network includes a large number of base stations BTS, which are connected to base station controllers BSC, each of which controls and supervises a number of base stations BTS. The base station controllers BSC are in turn connected to at least one switching centre MSC (Mobile services Switching Centre).

The switching centre MSC is adapted to control the traffic within a GSM network, as well as between this network and other networks connected thereto, such as a public telephone network PSTN (Public Switched Telephone Network) or the GSM network of another operator.

Two different registers are also connected to the switching centre MSC, namely a home location register HLR containing information on the system's own subscribers, and a visitor location register VLR containing information on active, and consequently registered, visitors found in the coverage area of the GSM network. A visitor is either a home subscriber or a subscriber associated with another GSM operator. The information in the visitor location register VLR is always retrieved from the subscriber's home location register HLR and includes an identity number IMSI (International Mobile Subscriber Identity) making it possible to positively identify and address a visitor. If a registered visitor ceases to be active in the network associated with the visitor location register VLR, the information on him found in the visitor location register VLR can be erased, to be retrieved from the home location register HLR when he becomes active again.

In addition to the home location register HLR, the identity number IMSI is always stored in a subscriber's

card SIM, a smart card, by means of which the mobile equipment is connected to a GSM network.

At present the subscriber's card SIM is available in two sizes, namely one "credit-card" size and one "stamp" size. However, the microchip in the card is of the same type for both sizes and consists of a small single-chip microcomputer. When inserting the subscriber's card SIM in a mobile terminal MT, such as a mobile telephone, the microchip of the card is connected to the mobile terminal which it thus activates. In GSM contexts, such an activated mobile terminal MT is referred to as a mobile station MS.

Since there is not room for the large subscriber's card SIM in small pocket phones, a subscriber intending to use such a small mobile telephone should of course, when subscribing to the system, be given a small "stamp-size" subscriber's card SIM, which also can be used in large-size mobile terminals MT. Regrettably, however, the small subscriber's card SIM is difficult to handle owing to its small size, and therefore rather lends itself to more or less permanent installation in the mobile equipment used most frequently by the subscriber, whereas the large subscriber's card SIM, owing to its handy "credit-card" size, is to be preferred for occasional use, e.g. when the subscriber is travelling and does not bring his own mobile equipment along.

Till now, each subscriber's card SIM, having its identity number IMSI in the home location register HLR, has always been firmly linked to the associated subscriber's number in one record. In the mobile communication system according to the invention, this has now been changed as follows.

When subscribing to the system, the customer obtains at least two subscriber's cards SIM, of which one is small and one is large. As before, different identity numbers IMSI, having their counterparts in the home location register HLR of the subscription, are stored in the sub-

scriber's cards SIM. In the home location register HLR, the identity numbers IMSI of the two subscriber's cards are stored in one record each, but only one of the records also contains the customer's subscriber's number. This
5 means that only one of the two subscriber's cards SIM associated with the same subscription is activated, i.e. can be addressed when there is incoming traffic to the subscriber, namely the card whose identity number IMSI is stored in the same record as the subscriber's number
10 in the home location register HLR, while the other subscriber's card SIM of the subscription is deactivated, i.e. cannot be addressed when there is incoming traffic to the subscriber. However, the subscriber's cards SIM always open the associated mobile terminals MT to outgoing traf-
15 fic, and the cards can always be identified owing to their unique identity numbers IMSI.

Since the subscriber's cards SIM always permit outgoing traffic when inserted in a mobile terminal MT, the subscriber can, by means of the mobile terminal MT, get
20 in touch with the operator's company exchange or with a switching centre MSC in the network, and hence with different operator service options in connection therewith.

One such option may be a billing administration support system BASS where the subscriber gets in touch with
25 telephone operators, or a voice mail system VMS which the subscriber has access to via service-specific codes entered on the key pad KP of his mobile terminal. When the subscriber orders the activation of a deactivated subscriber's card SIM, one of the two systems BASS and VMS, or
30 some other suitable system, may enter the home location register HLR and activate one of the subscriber's cards SIM while simultaneously deactivating the currently activated subscriber's card SIM either by shifting, in the home location register HLR, the identity number IMSI of
35 the currently activated subscriber's card SIM from a record for the subscription, which also contains the subscriber's number, to another record for the subscription,

which does not contain the subscriber's number but contains the identity number IMSI of the currently deactivated subscriber's card SIM, while simultaneously shifting the last-mentioned identity number IMSI to the record
5 containing the subscriber's number, or by shifting the subscriber's number from a record for the subscription, which is associated with the currently activated subscriber's card SIM which is deactivated after the shift, to another record for the subscription, which is associated
10 ed with the currently deactivated subscriber's card SIM which is activated after the shift. The subscriber never notices the shift of the identity numbers or the subscriber's number between the two records, but merely finds that the cards are easily activated and deactivated as
15 often as he wishes.

Alternatively, the identity numbers IMSI of the subscriber's cards SIM can be stored in one element each in one and the same record in the subscriber register HLR. In this record, the subscriber's number is then linked only
20 to the identity number IMSI of the activated card SIM, so that the alternation between the cards SIM is achieved by linking the subscriber's number to another record element containing another identity number IMSI.

Naturally, it is also conceivable to activate a subscriber's card SIM automatically, by the subscriber's
25 standing order, as soon as the card is inserted in a mobile terminal MT or as soon as this terminal is used for an outgoing call.

The invention expediently remedies, in a manner
30 advantageous to the subscriber as well as the operator, the inconveniences caused by the original "credit-card-size" subscriber's card SIM being complemented with a small subscriber's card SIM which fits into even small pocket phones.

35 Even though the preferred embodiment described above relates to a GSM network, the invention is of course not restricted to this type of network, and can also be

9

applied to other digital mobile communication systems
where the subscription is linked to smart cards.

5

10

15

20

25

30

35

CLAIMS

1. A digital mobile communication system comprising
5 a switching centre (MSC), a subscriber register (HLR) connected thereto, mobile terminals (MT), such as mobile telephones, and subscriber-linked subscriber's cards (SIM), such as smart cards, insertable in the mobile terminals (MT), c h a r a c t e r i s e d in that each sub-
10 scription is allocated a subscriber's number and at least two subscriber's cards (SIM) adapted to be activated so as to open a mobile terminal (MT) to incoming as well as outgoing traffic when inserted therein, such that, when one of the cards is activated, the other or others are neces-
15 sarily deactivated so as to open a mobile terminal (MT) only to outgoing traffic when inserted therein, the subscriber register (HLR) being adapted, by the order of the subscriber, to control the activation and the deactivation of the cards.

20 2. A digital mobile communication system as set forth in claim 1, c h a r a c t e r i s e d in that the subscriber's cards (SIM) have different identity numbers (IMSI), each stored in a record in the subscriber register (HLR), that the subscriber's number is stored only in the
25 record containing the identity number (IMSI) of the activated card, and that the subscriber register (HLR) is adapted, by the order of the subscriber, to shift the identity numbers between the different records so as to activate and deactivate, respectively, the cards (SIM).

30 3. A digital mobile communication system as set forth in claim 1, c h a r a c t e r i s e d in that the subscriber's cards (SIM) have different identity numbers (IMSI), each stored in a record in the subscriber register (HLR), that the subscriber's number is stored only
35 in the record containing the identity number (IMSI) of the activated card, and that the subscriber register (HLR) is adapted, by the order of the subscriber, to shift the

11

subscriber's number between the different records so as to activate and deactivate, respectively, the cards (SIM).

4. A digital mobile communication system as set forth in claim 1, c h a r a c t e r i s e d in that the sub-
5 scribe's cards (SIM) have different identity numbers (IMSI), each stored in an element in one and the same record in the subscriber register (HLR), that the subscriber's number is linked only to the element containing the identity number (IMSI) of the activated card (SIM),
10 and that the subscriber register (HLR) is adapted, by the order of the subscriber, to link the subscriber's number to another of the elements in the record, so as to activate and deactivate, respectively, the cards (SIM).

5. A digital mobile communication system as set forth
15 in any one of claims 1-4, c h a r a c t e r i s e d in that one of the subscriber's cards (SIM) is a small "stamp-size" card, and that another of the subscriber's cards (SIM) is a large "credit-card-size" card.

20

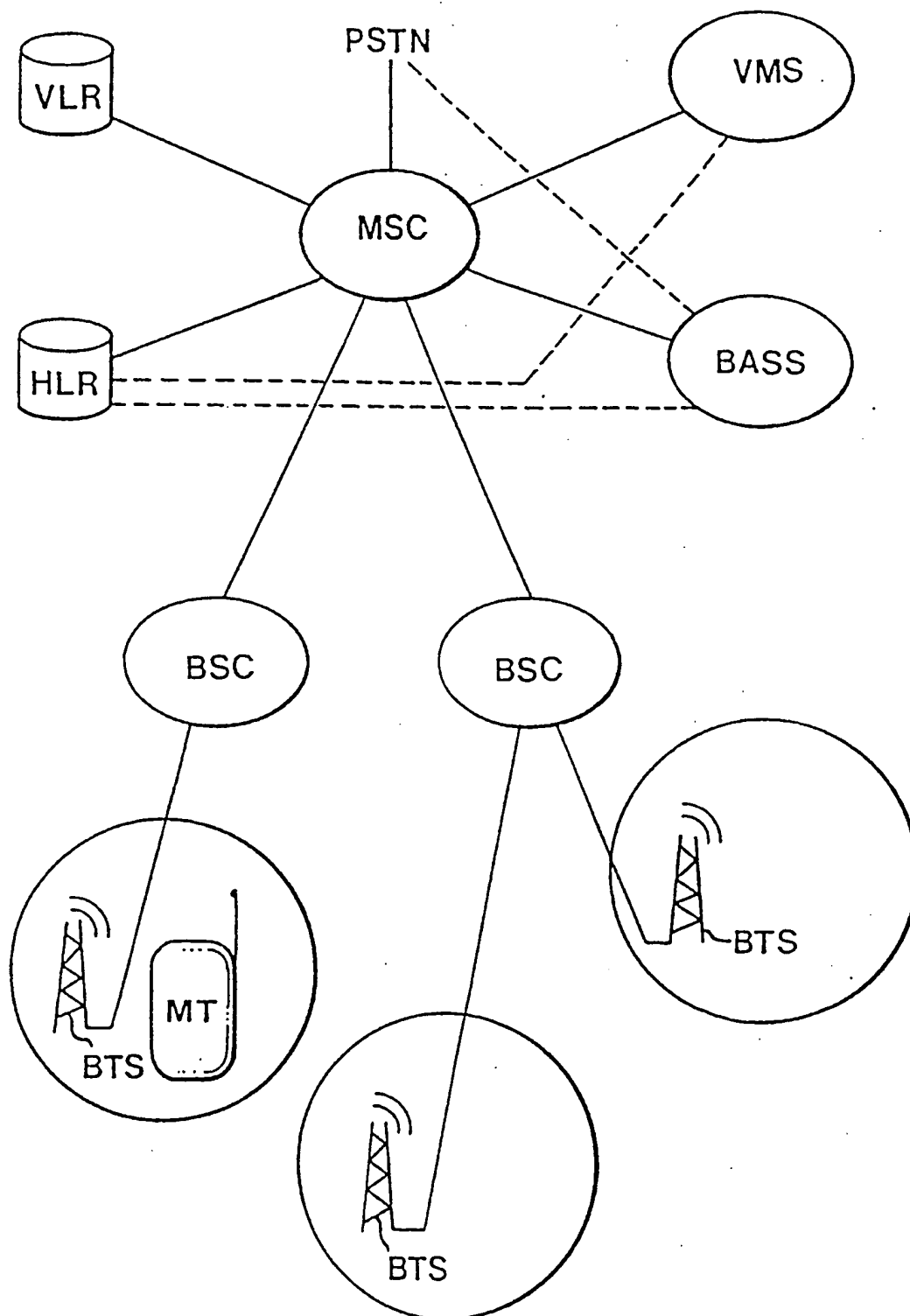
25

30

35

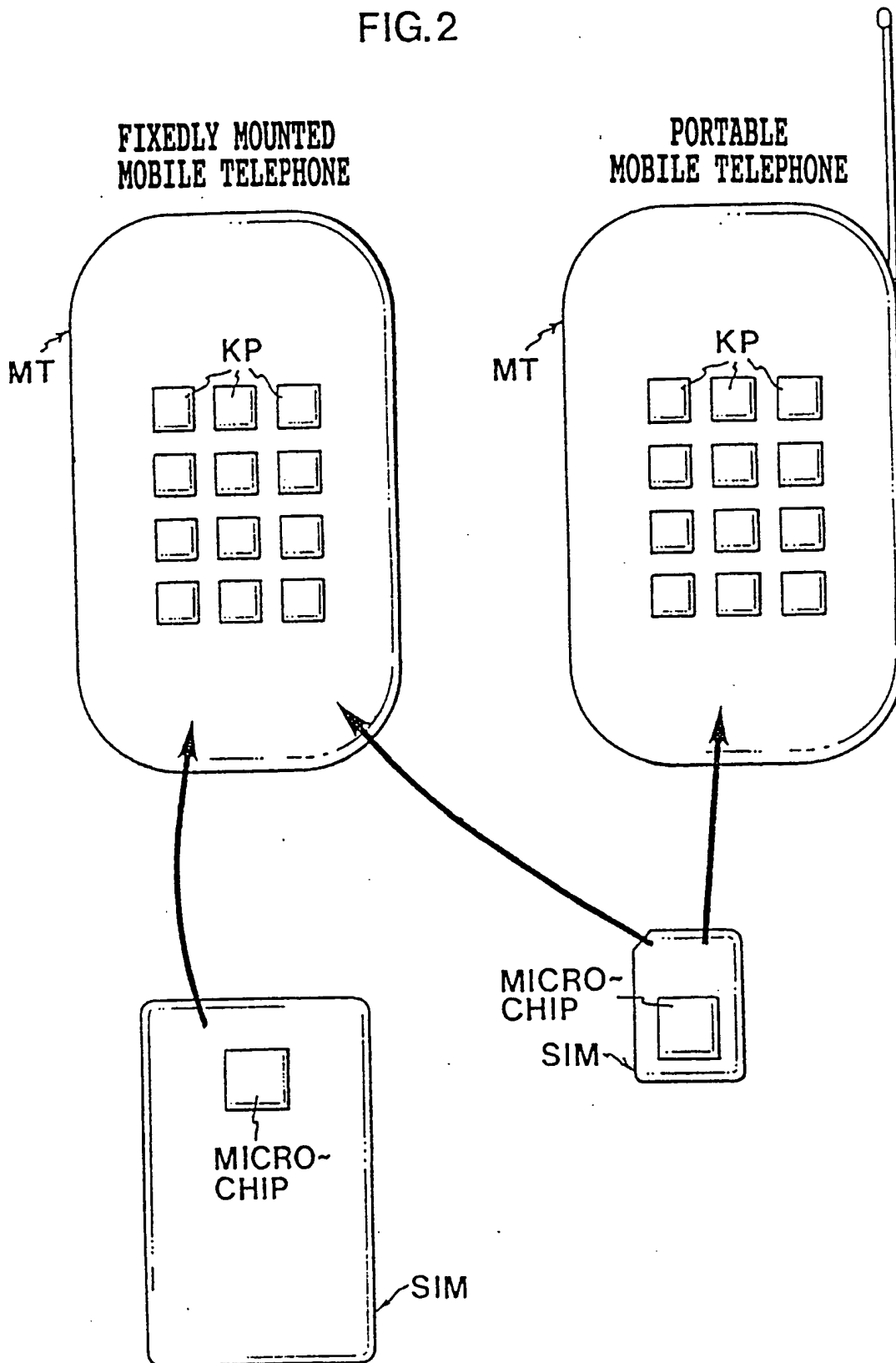
1/2

FIG.1



2/2

FIG.2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00784

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: H04Q 7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: H04Q, H04M, H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DIALOG: WPI, CLAIMS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A2, 0481714 (VODAFONE LIMITED), 22 April 1992 (22.04.92), figure 1, abstract --	1-5
A	EP, A2, 0378450 (TECHNOPHONE LIMITED), 18 July 1990 (18.07.90), figure 1, abstract --	1-5
A	US, A, 4734928 (SHELDON WEINER ET AL), 29 March 1988 (29.03.88), figure 1, abstract --	1-5
A	SE, B, 467559 (COMVIK GSM AB), 3 August 1992 (03.08.92), figure 6, abstract --	1-5

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

3 January 1994

Date of mailing of the international search report

11-01-1994

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Stefan Svahn
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00784

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,E	EP, A2, 564105 (NOKIA MOBILE PHONES LTD), 6 October 1993 (06.10.93), see the whole document -- -----	1-5

INTERNATIONAL SEARCH REPORT
Information on patent family members

27/11/93

International application No.

PCT/SE 93/00784

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A2- 0481714	22/04/92	GB-A- 2248999	22/04/92
EP-A2- 0378450	18/07/90	SE-T3- 0378450	
		DE-U- 6900021	27/08/92
		EP-A,B- 0406985	09/01/91
		SE-T3- 0406985	
US-A- 4734928	29/03/88	US-A- 4677653	30/06/87
SE-B- 467559	03/08/92	AU-A- 1466192	17/11/92
		SE-A- 9101105	03/08/92
		WO-A- 9219078	29/10/92
EP-A2- 564105	06/10/93	NONE	